

DELAWARE STATE MEDICAL JOURNAL

Official Organ of the Medical Society of Delaware
INCORPORATED 1790

VOLUME X
NUMBER 6

JUNE, 1938

Per Year \$2.00
Per Copy 30c

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Published as second class matter June 25, 1938 at the Post Office at Wilmington, Delaware, under the Act of
March 3, 1907. Business and Editorial office, 4008 The South Building, Wilmington, Delaware. Issued monthly.
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The manufacture of tinplate and "sanitary" cans is described elsewhere (1).

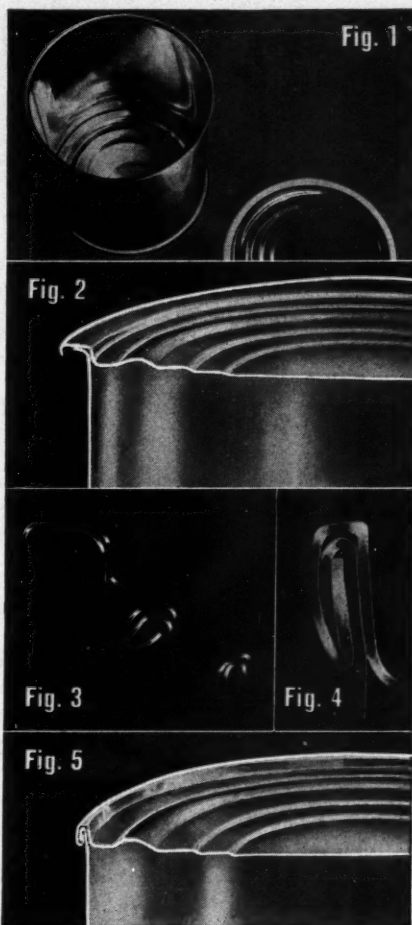
The open cans are received at the cannery in paper cartons or in washed paper-lined box cars, together with the covers which are contained in fiber shipping tubes. Figure 1 shows a can and end ready for use.

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In Figure 2 is shown the relation of can to cover before the sealing operation is started; note the relative position of the "curl" on the cover and the "flange" on the can. In this curl, the can manufacturer has placed a gasket or "compound," usually containing rubber. Figure 3 is a series of photographs illustrating the sealing operation in which the curl and flange are first rolled into position and then the layers of metal flattened together to form the final "double-seam" in Figure 4. The rubber compound originally present on the cover supplies the binding material between the layers of metal necessary to insure a permanent or hermetic seal on the container. Figure 5 illustrates in cross-section a closed sanitary can as it comes to the consumer.

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(1) The Story of the Tin Can, American Can Company, New York, 1935



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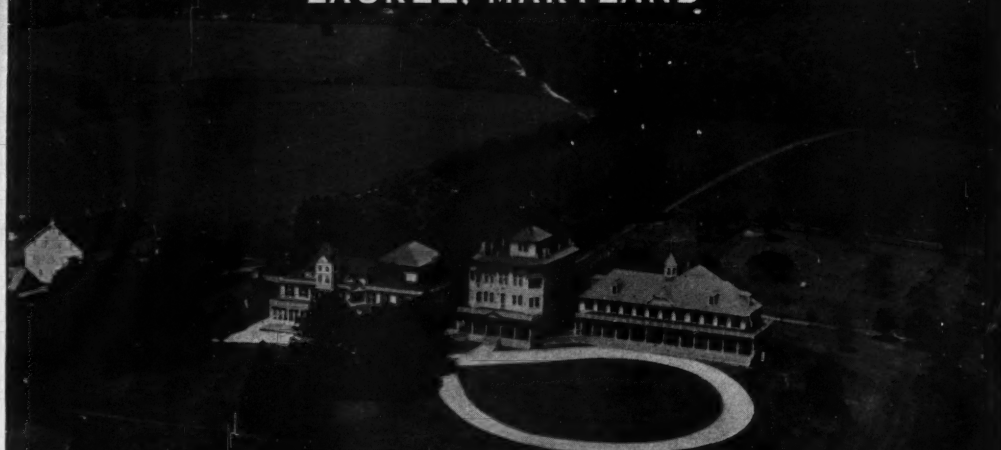
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Volume X
Number 6

JUNE, 1938

Per Year \$2.00
Per Copy 20c

AN EXTENSIVE CASE OF CREEPING ERUPTION FROM THE STATE OF DELAWARE

F. EARLE KUNKEL, M. D.,*
Philadelphia, Pa.

This is the first case of creeping eruption, as far as the writer has been able to ascertain, ever to be reported from the state of Delaware. It is possible that this disease is more prevalent in Delaware than one would imagine, and perhaps is not being recognized. Because the presence of a large number of lesions in a patient with creeping eruption is probably rare in this state, the following case report should be of great interest.

CASE REPORT

G. S., a male 47 years of age and foreman of a gas works' crew, was referred from the southern part of Delaware to the service of cutaneous medicine of the University of Pennsylvania Hospital on August 29th, 1937. The chief complaint was a dermatosis involving the left hip, left thigh, and abdomen. The disease was of 17 days' duration and was accompanied by itching, so intense at times as to be almost unbearable, especially during the night. On August 11th, 1937, he crawled under a house to repair a gas pipe. It was a hot and humid day. Perspiring freely as he lay working on his left side on a damp sandy soil, his clothing became loose and displaced, exposing bare areas of skin about the waist and left arm. A dead dog had been removed from this site about July 15th, 1937. Two or three hours following completion of his work, he complained of itching along his left flank and left arm, and the following morning a blotchy erythema was noticed in these regions. Two days later, small linear and tortuous lesions were observed associated with small erythema-

tous papules and vesicles. Various ointments and lotions were used, but the dermatosis continued to spread. Itching and burning became so intense that the patient obtained only one or two hours' sleep each night and had lost seventeen pounds in weight since the onset of symptoms.



Photograph of the left hip and thigh taken ten days following admission to hospital (creeping eruption of 27 days duration), illustrating the tortuous and serpiginous, slightly raised erythematous burrows and secondary excoriations with remnants of superimposed superficial pyogenic infection.

Cutaneous examination on admission to the hospital showed numerous, erythematous, slightly raised, tortuous and serpiginous, narrow and threadlike burrows disposed over the anterior and external aspects of the upper left thigh, the left hip, lower left abdomen and lat-

*Assistant Professor, Department of Dermatology and Syphilology, School of Medicine, University of Pennsylvania.

eral surfaces of the left arm and forearm. In the majority of the lesions one end was more elevated than the other, while in other instances both ends of the lesion tapered off into fine linear or tortuous erythematous lines. A moderate number of vesicles and erythematous papules varying in size from pin-head to 0.5 cm. were present along these burrows. Superimposed was a secondary impetiginous scratch dermatitis consisting of pustules and mildly inflammatory papules with excoriated tops, some of which were capped by hemorrhagic crusts. Some oozing and superficial, thin, plate-like, easily detached crusts were present as well as numerous linear excoriations and irregular patches of hyperpigmentation. The end of some of the linear and tortuous lesions advanced from about 0.5 cm. to one cm. in each 24 hours during the patient's stay in the hospital.

Laboratory studies at different intervals revealed a continued leucocytosis varying from 14,500 to 19,000 with polymorphonuclears ranging from 58% to 77%, lymphocytes 11% to 16%, mononuclears, 3% to 5% and eosinophiles 23% to 5%. No anemia was present. Several urine examinations were negative. Blood urea nitrogen and blood sugar examinations were normal. Stool examinations for parasites and ova were also negative. One complete lesion was excised for biopsy study. Intensive search in histologic sections by Dr. Herman Beerman* has failed to demonstrate the parasite.

The treatment during the first four days in the hospital was limited entirely to clearing up the secondary pyogenic infection by the use of mild local antiseptic lotions and ointments. Refrigeration of the lesions was performed after the pyogenic element was under control. From four to eight lesions were treated once or twice daily in the following manner: each day all areas were carefully examined and the more active lesions were marked; at the non-elevated or less raised end of each lesion, an area about the size of a twenty-five cent piece, in advance of, but just including the end, was frozen with an ethyl chloride spray for a period of about thirty seconds; on two occasions several resistant lesions were

refrigerated with solid carbon dioxide for five seconds.

Eighteen days following the beginning of refrigeration, ninety percent of all lesions were cured, and itching was no longer present. Ethyl chloride spray treatments were continued at home, and in one week following discharge from the hospital the patient was entirely cured.

DISCUSSION

"Creeping eruption" is an accidentally acquired dermatosis characterized by narrow, linear, tortuous and serpiginous lesions produced by the migration of animal parasites within the skin. It was first described in 1874 by Lee¹, an English physician. He described a peculiar reddish line on the abdomen of a small child. The eruption was first noticed by the mother about three weeks before admission into the hospital. It started as a red line just below the right ankle and gradually traveled up the leg and thigh and on the abdomen, meanwhile fading on the leg. Dickinson, T. Fox and Duckworth² tried, but failed to recover an animal parasite from the tissues. Crocker³ in 1893 saw another case in England, and suspecting an insect larva as the cause, proposed the term larva migrans. In 1895, Samson-Himmelstjerne⁴ removed a parasite from a lesion of "creeping eruption" and thought it to be the larva of the horse bot fly, *Gastrophilus*. Sokolow⁵ reported in 1896 on a small worm which migrated in the epidermis of the skin. A parasite removed by Sokolow was identified by Choldkovsky, an entomologist, as the larva of the horse bot fly. Since these reports, various skin diseases have been diagnosed "creeping eruption." The difficulty arises in the fact that the term "creeping eruption" is not an etiologic entity. In perusing the literature one finds that several different animal parasites may invade and migrate within the skin and cause a "creeping eruption."

The first three cases of this disease described in the United States were by Van Harlingen⁶. Reports by Stelwagon⁷, Hamburger⁸, Shelmire⁹, Hutchins¹⁰, Moorhead¹¹, and others then followed.

The casual parasite is not the same in every instance. Sokolow⁵, Rudell¹², Knowles¹³, Schalek¹⁴, Corrigan¹⁵, Austman¹⁶, Miller¹⁷,

Montgomery¹⁸, Bedford and Williams¹⁹ all demonstrated that the larvae of *Gastrophilus*, the bot fly, was one of the causative organisms. Just how infection occurs in this group is not known. The larvae of *Gastrophilus* usually can be seen with a hand magnifying lens on the skin of an infected person as a black dot or speck one cm. or more ahead of the progressing end of a linear lesion. Once the larva is located it can easily be removed in much the same manner as *Sarcoptes scabiei* is removed from its burrow, since it is situated in the superficial layers of the skin. The larva measures from one to 1.5 mm. in length and 0.5 mm. in width, has ten segments and is provided with hooklets about the head. Knowles¹³ excised an entire burrow and made over 4000 serial sections. Probably 20 of 4000 sections showed the parasite in the epidermis, rather close to the horny layer. Miller states that this form of disease due to the invasion of the skin by larvae of the horse bot fly should be of interest to those living in the north central states, but admits that this type of "creeping eruption" is rather rare. However, he thought it probable that the incidence may be much higher, but that the cases have not been recognized, or if recognized have not been reported. Shelmire²⁰ reported that in no single instance has this larva ever been recovered from the hundreds of cases occurring in Texas and Florida. He feels that it is incorrect for one to believe that "creeping eruption" is frequently due to this bot fly larva.

There is another group due to the invasion of the skin by the larval forms of the cattle grub fly, *Hypoderma*. Topsyant²¹ reported a case from France in which the larva traveled as a small lump beneath the skin and was accompanied by pain. The larva was removed from a swelling as large as a hazelnut. Shelmire claims that the migrations of the larvae in these cases were deep, and that the parasites were usually recovered from abscesses, tumors and furuncle-like lesions; only occasionally did they produce linear lesions on the skin surface. When linear lesions do occur, the larvae often traverse the length of the body and remain in the skin for several months. In such cases, painful, nodular swellings occur during the resting stages of the larvae.

"Creeping eruption" has occurred in Siam, the Malay States, China and Japan from pig and cat nematodes of the genus *Gnathostoma*, as evidenced by reports of Tamura²² and Morishita and Faust²³. Most of the lesions in these cases were cutaneous abscesses and tumors, somewhat similar to the lesions caused by *Hypoderma*. The elongated worms, often one cm. or more in length, were removed from their burrows without difficulty. Such a disease has never been reported in this country.

In 1927, Wright, Klauder and Hollingsworth²⁴ presented before the Philadelphia Dermatological Society a child, ten years of age, with a raised linear serpiginous eruption which started on the sole of the left foot, migrated over the outer side and onto the dorsum of the foot. From the terminal portion of the lesion an organism was removed. Dove and Rohner of the Bureau of Entomology, Washington, identified this as an ant, *Selenopsis geminata* Fabr. var. *rufa* Jerd.

Kirby-Smith, who has contributed more to the knowledge of this disease than any other person in this country, described still another but most important group prevalent along the coastal parts of our south Atlantic states, sections of the Gulf region as far west as Texas, and in the sandy areas of Arkansas and Oklahoma, due to the larval stage of a nematode. Kirby-Smith, Dove and White²⁵ reported in 1926 for the first time the casual nematode larva. Because they were unable to discover the adult worm of the species, they provisionally called this larva *Agamonematodum migrans*. Feces of dogs and cats inhabiting the localities at the time creeping eruption was most prevalent were then cultured for larvae by White and Dove²⁶. Autopsies were performed on these dogs and cats and two species of worms having third-stage larvae were found, *Ancylostoma braziliense* and *Ancylostoma caninum*. When pure cultures of *Ancylostoma braziliense* were applied to the human skin, characteristic lesions of creeping eruption developed, but when pure cultures of *Ancylostoma caninum* were used in a similar manner typical lesions did not occur. They described the larva as being 600 microns (0.5 mm.) in length, and 20 microns in width. The larvae do not multiply or reach maturity in the human skin. In none of the experimen-

tal cases did intestinal hookworm disease develop in man, stool cultures always being negative for larvae. Moist sand was found to be a good medium for the growth of the larvae. Dryness definitely retarded their growth as well as low atmospheric temperatures. All these experimentations were confirmed by Shelmire²⁰. Penetrations of the human skin by the larvae readily take place in the presence of atmospheric temperatures sufficient to cause visible perspiration. Following the penetration of the skin there is usually felt a stinging sensation within ten minutes. This subjective symptom may be delayed for more than an hour or may be entirely absent, as illustrated in the case reported by McCarthy²⁷. The larvae remain at the points of ingress before starting to migrate. Shortly following this entrance, macules slightly larger than the head of a pin develop. Within an hour or more the macules develop into urticarial or papular lesions similar to that of the bites of chiggers or mosquitoes. From these points, advancing threadlike or linear lesions are usually observed in from two to four days, although in McCarthy's patient it was not observed until two months had elapsed. The development of linear lesions is preceded by itching. The slightly elevated portion of skin over a burrow resembles that made by a mole in the meadows. Abrupt changes in direction of the lesions are usually observed, giving rise to the characteristic linear, tortuous and serpiginous configuration. The migration may continue for several weeks or even months. In cases of long duration the travel of the parasite is interrupted by periods of rest. The advancing portion of a lesion may be seen as a thin thread-like hyperemic line with practically no elevation at the extreme point. The older part of the lesion is usually more elevated, while further along toward the advancing end may be seen papules, vesicles, or even bullae. Itching is so intense at times as to be almost unbearable, especially at night when the migration may even be accompanied by a stinging type of pain. Due to scratching, bacterial infections frequently occur, resulting in pustule formation, either superficial or deep or even progressing to abscess formation. Considerable variation occurs in the rate of migration. While the distance traveled by the

parasite during twenty-four hours may exceed an inch, the daily average is usually a fraction of this distance. Lesions have been observed on every part of the body. The eruption, however, occurs more often on the feet, as infection takes place on those portions of the body that come in contact with polluted soil. The buttocks and hands are also frequently infected.

Despite frequent attempts mechanically to remove the larva *Ancylostoma braziliense* from a lesion, Hume²⁸ has been the only one to have reported the successful removal of the parasite. This he was able to do in only one instance, despite numerous attempts.

The usual hosts of the intestinal parasite, *Ancylostoma braziliense*, in this country are dogs and cats. Eggs are deposited on the ground through the feces of dogs and cats harboring the intestinal hookworm. With proper moisture in the soil together with proper warmth, the larvae then develop. Within twenty-four hours the first stage larvae are produced. These continue to develop until they reach the actively migrating second stage larval forms four days later. It is in this stage that the larvae penetrate the skin after losing their chitinous sheath. No further development of the larvae takes place following penetration.

The microscopic demonstration of the larvae in sections of tissue removed for biopsy is not always easy. Kirby-Smith, Dove and White²⁹ were able to demonstrate the larvae in only five out of forty-eight skin excisions studied from serial microtone sections. They made more than 40,000 sections. McCarthy²⁷, after studying 118 sections, was able to find the larva in only six slides. The difficulty in demonstrating the larva is due not only to its small size, but also to the fact that the parasite lies in the skin some distance ahead of the visible advancing end of the burrow. This makes it impossible to calculate accurately the size of the biopsy necessary to include the larva.

Kirby-Smith, Dove and White²⁹ reported that infections were most frequent during the summer, especially following rainy weather, along the coastal plains from New Jersey south and west to Texas inclusive, and in sections with a sandy type of soil. The disease

is not seen during the winter months. Persons become infected when they come in contact with damp, sandy soil contaminated with second stage larvae of *Ancylostoma braziliense*. Floating surface water following rain-fall may transport the larvae from one infested spot to other places. The parasites may also be disseminated by the water of streams. Many patients have traced their infections to the beach while lying on the damp sand slightly above the level of high tide and in front of the board walks. Other areas of damp, sandy soil contaminated by dogs and cats have been sources of infection, such as banks of streams, sand boxes, children's playgrounds, sand near buildings, and flower and vegetable gardens. Infection sometimes occurs from soil which has been hauled in grading. Patients most extensively infected, according to Kirby-Smith, have attributed the source of their infection to contact with damp, sandy soil while working underneath houses, wet with perspiration. Plumbers, electricians, masons and gardeners may become infected from polluted soil while following their respective occupations. Wet clothing exposes the skin to invasion by the parasite, whereas dry clothing protects against infection.

Dove³⁰ reported that creeping eruption appears to be distributed according to the exposure of persons to infected soil, and not to any susceptibility of an individual. The lack of susceptibility encountered in the negro race, in whom the disease is rare, is not fully understood.

Creeping eruption may occur at any age, but the greatest number of cases are seen in children, especially during the midsummer, when many of them go barefoot and come in contact with soil infested with larvae. It is also during the summer months that adults as well as children frequent the beaches and come in direct contact with polluted sand. Again, it is also during the hotter and more humid weather that workmen, wet with perspiration, as in the writer's case, lose their protection from creeping eruption infections afforded them by dry clothing.

The treatment of creeping eruption has been recently described by Kirby-Smith³¹. Prophylaxis consists in the prohibiting of children to go barefooted during the summer

months in localities where creeping eruption might occur, especially when the soil is wet following rains. Children should not be permitted to wade in the streets or places where floating surface water is flowing or has stood. Neither should they wade in or along the banks of streams. Adults and children should be careful not to sit on or expose their bodies to soil or other wet places polluted with larvae of *Ancylostoma braziliense*. Vagrant dogs and cats should not be permitted in areas where the disease is prevalent. Dogs and cats should be prohibited especially from frequenting beaches and play places of children.

The success of the treatment of creeping eruption is dependent upon the destruction or removal of the larva. It is the inability at times to locate the parasite accurately, because of its travels in advance of the visible lesion, that makes the treatment difficult. If one is dealing with only a single lesion, the ideal treatment would be excision, provided it were certain that the larva was included in the excised skin. Of this one cannot always be assured. Kirby-Smith reports that it is apparently impossible to cure this disease with simple measures as are used in the treatment of other parasitic infections, such as scabies and simple types of dermatophytosis. The best method of curing creeping eruption, according to Kirby-Smith, is refrigeration, either with ethyl chloride spray or solid carbon dioxide. Shelmire⁹ first proposed the use of ethyl chloride spray. Ketron³² was also successful in using this freezing method. In uncomplicated lesions an area of about the size of a twenty-five cent piece including but also in advance of the progressing end of a burrow, is thoroughly frozen with an ethyl chloride spray for from two to four minutes, according to Kirby-Smith. The writer, in the case reported, used an ethyl chloride spray for approximately thirty seconds, but some of the lesions had to be treated on two or three different occasions. However, over fifty percent of the lesions were cured by only one application. Kirby-Smith reported that the area to be treated could at times be determined with the cooperation of the patient, the spot where the itching is most intense being then outlined with mercuriochrone and thoroughly

frozen from two to four minutes. With each visit the whole field is carefully gone over in this manner, determining in advance the location and number of lesions to be treated on that particular day. The treatments, according to Kirby-Smith, should produce bullae. With a sterile needle, the serum should be withdrawn from the bullae the following day and a dry, sterile gauze applied. No bullae were produced following treatments in the author's case. This was due, no doubt, to the fact that no lesion was refrigerated for as long a time as that advocated by Kirby-Smith.

As the majority of cases occur in children, it is not always possible to get the cooperation of the patient in determining the area to be treated. Many of them have the infection, according to Kirby-Smith, on the feet or hands, and have usually, before consulting a physician, been treated at home with various chemical irritants, or have developed secondary pyogenic infections from scratching the intensely itchy lesions. When first seen, all bullae and pustules should be opened and drained and treated locally with a mild antiseptic. This same procedure should be practiced in adults who have multiple lesions with secondary superficial pyogenic dermatitis, furuncles or even abscess formation. For several days the infected areas should be treated with mild antiseptic solutions, such as Burow's. When the secondary infection has subsided, and the active lesions become well defined, refrigeration then can be used. The treatments are continued until itching is no longer present and no active lesions are observed.

The injection of various chemicals, such as chloroform, tincture of iodine, benzine, etc., in and around the lesions is, according to Kirby-Smith, impractical. Klauder and Greenbaum¹¹, however, cured a case of creeping eruption in about five days after daily application of tincture of iodine to the entire length of the burrow. Kirby-Smith, who is under the impression that he was the first to use a crayon of solid carbon dioxide effectively in 1910, does not advocate this procedure because of the extreme pain and the slow healing of the treated area. Electro-dessication, he

feels, is a very difficult and doubtful procedure.

COMMENT

Although I fully realize that the etiology of creeping eruption cannot be accurately determined unless the organism is actually demonstrated, it seems reasonable to presume that the case reported here was creeping eruption caused by larvae of *Ancylostoma braziliense* because of the following reasons:

1. The patient contracted the disease within the geographical area, as mentioned by Kirby-Smith, Dove and White, in which larvae of a cat or dog hookworm, *Ancylostoma braziliense*, are most likely to be found.
2. The history of body contact with moist sandy soil underneath a house on a hot, humid day while the patient was wet with perspiration.
3. The probability that the soil was infested during the summer with larvae from a dog who had previously inhabited this site.

CONCLUSION

An extensive case of creeping eruption is reported for the first time as having originated from the state of Delaware, the etiology of which was probably the larvae of *Ancylostoma braziliense*. Treatment was successful following the refrigeration of the lesions with an ethyl chloride spray and solid carbon dioxide.

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UROLOGY: ITS RELATION TO GENERAL MEDICINE*

LANG W. ANDERSON, M. D.**
Wilmington, Del.

In selecting a subject to present before this Society it occurred to me that most of the men, especially those who are engaged in general practice, would perhaps be more interested in hearing a general discussion rather than a formal topic. Therefore, with your indulgence, I shall endeavor to emphasize some of the more common urological conditions encountered in general practice.

Prior to about twenty-five years ago the urologist was looked upon as nothing more than a venerologist by both the profession and the public. But, with the advent of the cystoscope by Nietzsche, which has been progressively

improved by Young, McCarthy, and others, he has, with the aid of the x-ray, been able to explore all of the genito-urinary cavities, thereby putting urology on a solid foundation and making it a dignified specialty, of which none excel and few equal. McCarthy states that urology is within 5% of an exact science, as to diagnosis; while the Mayo Clinic claims it is within about 3%.

It was the urologist who first routinely employed blood chemistry and renal functional tests, with a resulting lowering of the mortality rate, from about 85% to 5%, in prostatectomy. To this has been added retrograde and intravenous uretro-pylography, cystography, and seminal vesiculography. These are only a few of the advances that have been made in urology, to say nothing of the development and refinement of the many urologic instruments within the past decade.

URINARY RETENTION AND INCONTINENCE

There are perhaps no other urological conditions met with as frequently in general practice as that of chronic urinary retention and incontinence in the aged, with its attending symptoms of urinary frequency, dribbling, etc. And here one is likely to mistake the retention for the incontinence. Not infrequently some of these patients will present themselves complaining of symptoms remote from their urinary tract, such as loss of appetite, nausea, vomiting, neuralgia, etc., which, as is well known, is due to the retention of their nitrogenous toxins. By employing palpation and percussion, the extent of the distended bladder may be determined, after which a catheter best adapted for introduction should be passed into the bladder, and just enough urine withdrawn to relieve the distress if present, but never more than 8 to 12 ounces, at the beginning. To violate this dictum is to invite disaster.

Many methods have been devised for decompressing a chronically over-distended bladder, but none is as practical as allowing 2 to 3 ounces of urine to escape from an indwelling catheter at intervals of 15 to 20 minutes, and at the same time giving the patient sufficient fluids so that the intake will be about 2/3 to 3/4 of the output.

All retention and incontinent cases should have a blood and spinal fluid Wassermann

*Read before the Medical Society of Delaware, Wilmington, October 12, 1937.
**Urologist, St. Francis and Wilmington General Hospitals.

test, as well as a neurological examination, to rule out the possibility of a cord bladder.

HEMATURIA

No condition in urology should concern the general practitioner and the urologist more than this, and especially do I refer to painless hematuria, since it is a danger signal calling for help, and not infrequently is the first sign of cancer somewhere along the genito-urinary tract. This type of hematuria is usually intermittent, and the cessation of bleeding may be attributed at times to the administration of a drug, which is responsible in some cases for the delay and loss of valuable time, prior to diagnosis and treatment. There is no better time for a cystoscopic examination than during the bleeding, when the source can be visualized and its origin determined, by whatever methods may be necessary.

If cancer of the bladder is recognized early, before it has infiltrated the bladder wall and metastasis has taken place, which is usually late, it can, in a majority of cases, be successfully treated through the cystoscope by fulguration and radon implantation, and with deep x-ray therapy.

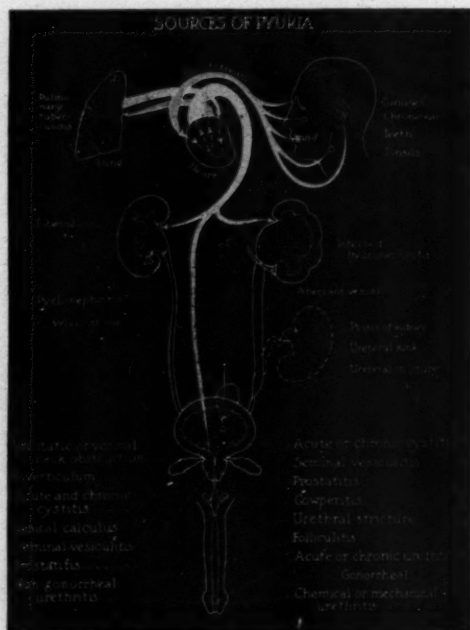


FIG. 1

By courtesy of the Henry Laboratories, Incorporated, Chicago

PYURIA

Pyuria occupies an important place in urology, since it indicates certain damaging processes in the genito-urinary tract; however, it is beyond the time allotted and scope of this paper to discuss all of its sources (Fig. 1). In the presence of symptoms of generalized infection, with recurrent fever, an investigation of the genito-urinary tract should always be made as a possible source, after other foci of infection have been eliminated. About 65% of all cases of renal tuberculosis are presented clinically with the picture of chronic cystitis; hence, if a pyuria persists with symptoms incident to this affection, one should suspect renal tuberculosis. In about 10% of the cases of this disease a symptomless pyuria is an outstanding picture. And it is to this small group that I would like to direct your attention, because some are permitted to progress until both kidneys are involved.

In about 90% of all cases of renal tuberculosis the disease remains confined to one kidney for a relatively long period, two to three years; therefore, it is obvious that early diagnosis would result in the saving of lives, since nephrectomy will result in about 60% of cures if the disease is still unilateral.

The teaching of urology has impressed upon every surgeon's mind the importance of a urological study in all obscure abdominal conditions, with the result that fewer mistaken diagnoses are being made in cases where urinary calculi, renal ptosis, and other urological conditions are the actual underlying causes. It is seldom that medical men continue to treat persistent hematuria, pyuria, pyrexia, and dribbling of urine without first determining their causes; however, there are a few who do make this mistake, and it is for the benefit of this minor group that these words of caution are offered.

The following cases will illustrate some of the conditions which I have just mentioned:

CASE I.—Retention and Incontinence from Prostatic Obstruction

White male, age 75 yrs. Admitted to the hospital July 28, 1937; complaining of pain in lower abdomen, dribbling and incontinence of urine for past year. Patient appeared quite toxic, dehydrated and emaciated. Temperature on admission 101°, pulse 90, and respira-

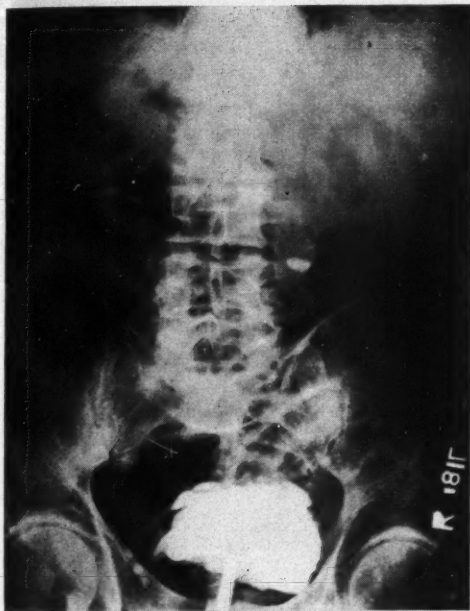


FIG. 2A
Bladder, completely filled with 12 1/2% sodium iodide solution, showing marked trabeculation.

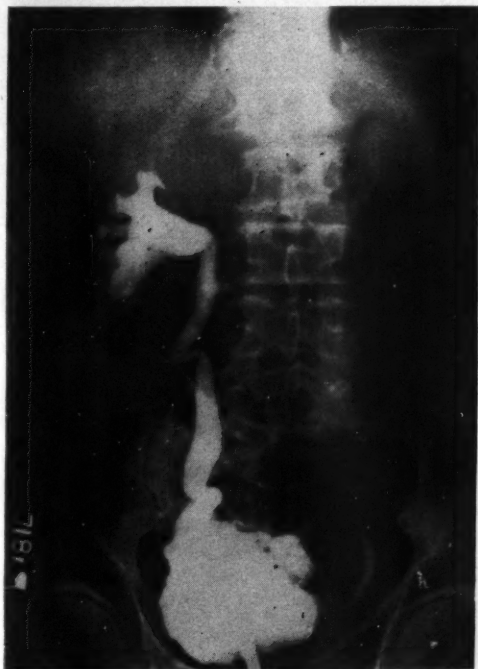


FIG. 2B
Another radiograph, made 15 minutes following cystogram, showing reflux of the sodium iodide solution up right hydro-ureter and kidney. Also, beginning reflux up left ureter.

tions 22. Palpation and percussion of abdomen revealed a bladder distended to the umbilicus, which was decompressed gradually.

Blood chemistry: urea nitrogen, 51 mgms; creatinin, 2.5 mgms.

August 25th: urea nitrogen, 24 mgms.

August 26th: cystogram. (Figs. 2A and 2B.)

Blood and spinal fluid Wassermann tests were negative.

September 14th, suprapubic cystotomy was done on account of patient having developed a peri-urethral abscess.

November 4th, transurethral resection of prostate. Recovery uneventful.

November 26th, patient discharged from hospital, completely relieved of his urinary symptoms.

CASE II.—*Hematuria, from Malignant Tumor of Kidney*

White female, age 46 yrs. Admitted to the hospital July 30, 1937; complaining of hematuria which she had off and on since 1931. Her attacks of bleeding were free of pain, except while passing strings of clots. She was treated by her family physician for each at-



FIG. 3
Retrograde pyelographic radiograph of both kidneys, showing tremendous enlargement of left kidney and distortion of ureter with elongation and irregularity of calyces.

tack of hematuria, who after five years, in June, 1936, referred her for a urological examination. She was cystoscoped but unfortunately not x-rayed and therefore was assured that she had no tumors.

In June, 1937, patient consulted another physician who referred her for a urological study. She was cystoscoped while bleeding and pyelographic x-rays (Fig. 3) were made, yielding a tentative diagnosis of malignancy of left kidney, which was confirmed by nephrectomy and pathological examination.

CASE III.—*Pyuria and Frequency from Tuberculosis*

White female, age 44 yrs. Admitted to the hospital June 11, 1936; complaining of frequency of urination, burning and cloudy urine for the past ten or twelve months, and pain in her left kidney region during the past three months.

Pyelograms (Fig. 4) indicated tuberculosis of the left kidney.

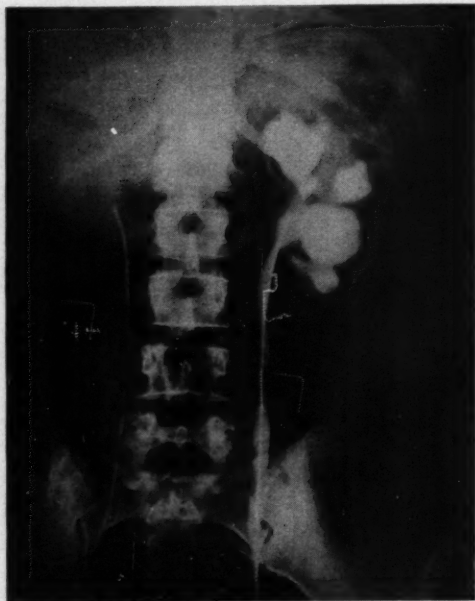


FIG. 4

Retrograde pyelographic radiogram of left kidney showing marked enlargement and distortion and clubbing of calyces.

Sediment of urine from bladder was negative for T. B., while urine obtained from left kidney revealed many T. B. bacilli. This was confirmed by guinea-pig inoculation, as well

as by pathological examination following left nephrectomy.

Fluoroscopic and x-ray examination of chest shows evidence of pulmonary T. B.

This patient is also a diabetic. I may mention that her attending physician had already made a tentative diagnosis of tuberculosis of left kidney and bladder prior to referring.

CASE IV.—*Pyuria and Hematuria, from Papillomata*

White male, age 59 yrs. Admitted to the hospital May 1, 1933; complaining of frequency of urination, associated with dysuria, cloudy urine and at times with hematuria, of two years duration.

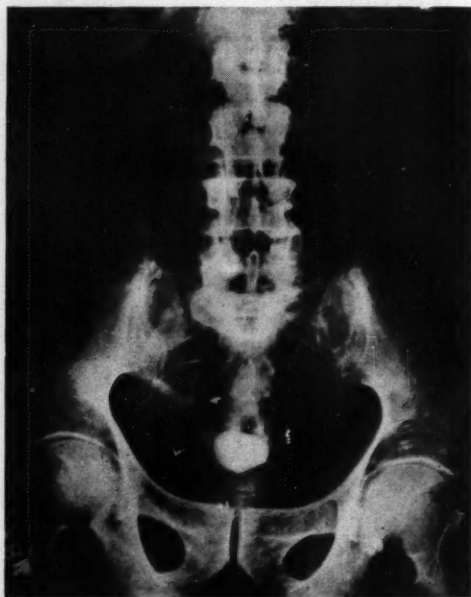


FIG. 5

Flat radiogram of bladder, showing large calculus and remains of radon seed which were previously implanted in the treatment of bladder growth.

Cystoscopy revealed three papillomatous growths about 3 to 4 cm. in diameter situated on both lateral walls and base of bladder, just internal to sphincter. Biopsy of tissue obtained from growths revealed papillary carcinoma, grade I.

May 20, 1933, a suprapubic cystotomy was done, growths were removed with tissue forceps and their bases implanted with 19 radon seeds, 2 m. c. each, at a distance of 1 cm. apart.

In August 1933, he was given three deep x-ray treatments of 200 K. V. each, but re-

fused to take more. He gained weight and had no further bladder symptoms until about six months ago, when he again had frequency, burning and dysuria.

June 6, 1937, he was readmitted to the hospital. X-ray and cystoscopy revealed a large calculus in bladder (Fig. 5), which was removed suprapubically. No further evidence of growths was observed.

X-rays of lungs and bony structures showed no evidence of metastases.

CASE V.—*Nephrolithiasis*

White male, age 38 yrs. Admitted to the hospital January 27, 1935; complaining of pain in the right side of abdomen since 1932.

Appendectomy in 1933. Re-operated on six to eight months later for adhesions which were thought to have developed following his appendectomy. No relief was obtained from his operations.

Cystoscoped and x-rayed in 1934 with negative findings.

X-ray of right kidney in 1935 (Fig. 6), revealed three small calculi, which were re-

moved by nephrotomy, followed by complete relief of symptoms.

CASE VI.—*Nephroptosis*

White female, age 21 yrs. Admitted to the hospital May 26, 1936; complaining of pain in right abdomen and loin of two years duration.

In January, 1935, patient entered hospital complaining of pain in right lower abdomen, frequency of urination and burning. Cystoscopy and pyelographic x-rays at this time revealed a cystitis and a ptosis of right kidney (Fig. 7A). After her acute symptoms subsided she was fitted with an abdominal support with kidney pad, which partly relieved her pain in right abdomen. In May, 1935, patient was seized with acute colicky pains in right abdomen. She was re-admitted to hospital and had her appendix removed, which contained a fecal concretion and also showed evidence of inflammation.

Following her appendectomy she continued to complain of pain in loin and right abdomen. In June 1936 a nephropexy was done according to Woodruff's method, with the end results as shown (Fig. 7B), and complete relief of her symptoms.

DISCUSSION

SECRETARY SPEER: If you gentlemen knew how the Program Committee tried to get members of this Society to present papers, and how difficult it was, after coming and listening to a paper like Dr. Anderson's you would realize that it only serves to prove that we do not have to go outside of our own state to make up a program, if the men will only get down to work and do what they are asked to do—to give us just the results of their own experiences.

This paper that we have just had, to my mind, is a very excellent one. It shows results that are being obtained right here in town, and I think it is a credit to our Society. I think that more men should give their time and their effort to do the same thing.

DR. W. E. BIRD (Wilmington): There are extremely few conditions for which consultants need be imported from out of the state. We have developed in this community now—I mean the state at large—men who have specialized in one field or another to the point where they are doing a great deal of work that compares not only with any small com-

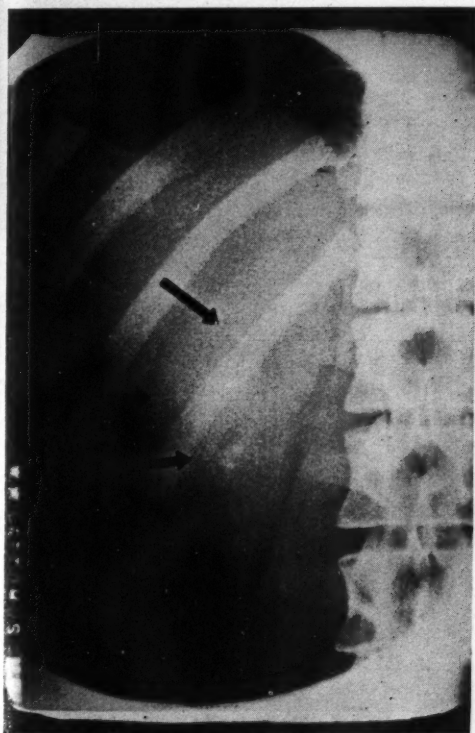


FIG. 6

Flat radiogram of right kidney showing three calculi in the lower, middle, and upper calyces.

munity, but very favorably with the largest communities in which there are teaching centers. There is not a man here who is not fully cognizant of that fact.

I want to make one comment about the contents of Dr. Anderson's paper. It is a splendid piece of work. We seldom see such beautiful pictures of injected seminal vesicles, for instance, just to mention one phase of the work.

The paper brings to my mind, clinically, the fact that we are not urologically minded enough. In my experiences I have taken out an appendix that looked as though its pathology could explain the patient's symptoms, only to find to my chagrin that the symptoms were not removed.

A few years ago the American Surgical Association spent a whole day discussing the problem of chronic appendicitis. They indicted the surgeons and the surgical results. In other words, they were criticizing themselves; and why? Simply because there is no

operation performed on the human abdomen which has as unsatisfactory results as the operation for chronic appendicitis; and that in turn simply causes in a great number of instances the realization that at the time of operation, the appendix pathology alone is not sufficient to explain the patient's symptoms, for, following the operation, he still has the symptoms.

One thing that must be eliminated in any right-sided condition, of course, is the urinary tract. I do not think we bear the G. U. system in mind quite enough when we examine the abdomen.

I remember, a few years ago, I was down in Savannah. Like Delaware, they have but one famous Dr. White. If you write a letter to "Dr. White, Georgia," it would go to Dr. George White, Savannah, just as if you would write a letter to "Dr. White, Delaware," it would be delivered to Dr. Charles White, Wilmington.



FIG. 7A

Retrograde pyelographic radiograms of right kidney and ureter in both the Trendelenburg and upright positions showing ptosis of kidney and angulation of ureter.

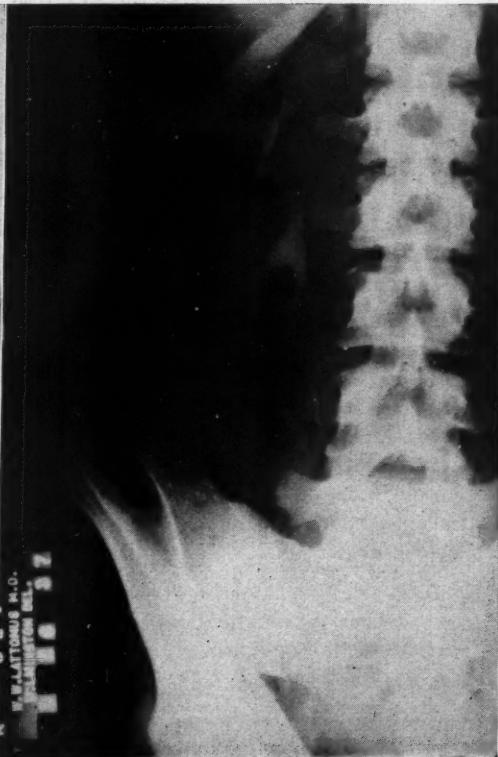


FIG. 7B
Intravenous urogram made in both the Trendelenburg and upright positions six months following nephropexy which shows the kidney to be in normal position.

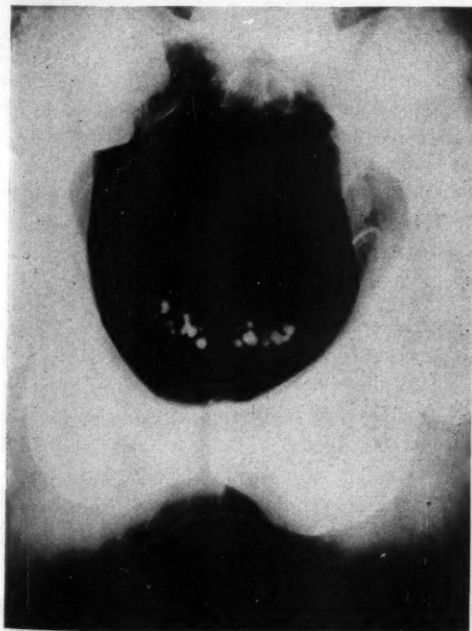


FIG. 8
A normal seminal vesiculogram.



FIG. 9
A vesiculogram of chronic seminal vesiculitis following gonorrhea, which shows distortion and irregularity of the rugae.

Dr. White was operating on a case of so-called chronic appendicitis, and he had an experience that showed something that I had never seen before and have only seen once or twice since—a contraction of the tendon of the psoas parvus. He has made up his mind that whenever he does a so-called chronic appendectomy, he is not only going to make incision enough to explore the whole abdomen with his hand, but, among other details, he is going to bear in mind to feel for a contraction of the psoas parvus, because he had it happen that he had operated before, only to find the symptoms returned almost as soon as the effect of the anesthesia was over. He had to go in again, and then discovered the contracted tendon, divided it, and presto: relief!

I thank you, Dr. Anderson, for bringing these conditions to our attention. We should be more urologically minded.

PRESIDENT WHITE: Are there any further comments?

What Dr. Bird said as to the letters that might come to Dr. White is all right, but you can go a step beyond that. Some years ago I was always getting letters for a Dr. White whose first initials were A. C. I always opened these letters and quickly closed them again, and gave them to the postman because they were not for this Dr. White. They were for another Dr. White, who since then committed suicide.

Does anybody wish to comment further on this paper? If not, we will ask Dr. Anderson if he has anything further to say.

DR. ANDERSON: I would just like to mention that this work on the injection of the seminal vesicles was developed by Drs. Ritter and McCarthy of New York.

FORCED DRAINAGE OF THE CENTRAL NERVOUS SYSTEM

SIDNEY ROCHELSON, M. D.*
New York, N. Y.

In the treatment of infections of almost any type, the simple procedure of "forcing fluids"

is of inestimable value in diluting toxins and in carrying the by-products of the infectious processes to excretory channels. However, the anatomy of the central nervous system is such that a somewhat more complicated procedure, known as "forced perivascular (spinal) drainage" is more effective in combatting infections of the central nervous system. Let us first review a few essential points of anatomy and physiology.

Anatomy. The central canal of the spinal cord is continued upwards through the lower part of the medulla oblongata and opens into the fourth ventricle. The cerebral aqueduct serves to connect the fourth with the third ventricle, while the Foramen of Monro connects the two lateral ventricles with the third ventricle and with each other. Projecting into all the ventricles are highly vascular fringed processes, the choroid plexuses, derived from the tela choroidea, a fold of pia mater. Lining the choroid plexuses, and all the ventricles, and central canal, is an ependymal layer, consisting of ciliated columnar cells. The bulk of cerebrospinal fluid is elaborated by the choroid plexuses and by the ependyma of the central canal. A small portion, however, is derived from the nerve cells themselves and by transudation from capillary vessels, in the parenchyma of the brain and spinal cord. This portion reaches the subarachnoid space through perivascular channels which surround all the blood vessels entering the brain and spinal cord.

In the roof of the fourth ventricle are two lateral openings (foramina of Luschka) and a medial opening (foramen of Majendie). These allow the cerebrospinal fluid from the ventricles and central canal to enter the subarachnoid space. The cerebrospinal fluid is absorbed in two ways: Through the arachnoid villi into the great dural sinuses, and into true lymphatic vessels by an indirect perineural course.

Physiology. The production of cerebrospinal fluid follows very much the same principles as governs the production of lymph in

*Intern, Wilmington General Hospital.

general. The osmotic pressure of the non-diffusible colloids of the blood is 25 to 40 mm. of mercury. A force greater than this, then, is necessary to promote the flow of fluid out of an arterial capillary. This force is provided by the blood pressure in the arterial capillary, and by the osmotic pressure of the pericellular fluid. There are several ways by which the production of lymph can be accelerated: 1. Raised arterial blood pressure.

2. Increased metabolism of the cells which increases the osmotic pressure of the lymph.

3. Lowering the osmotic pressure of the blood by injection of hypotonic solution.

4. Preventing re-absorption of lymph on the venous side by venous obstruction. In the central nervous system, the choroid plexus is a barrier against venous re-absorption.

5. Increased permeability of the capillary wall. This occurs in inflammations of any type.

DEVELOPMENT OF FORCED DRAINAGE OF THE C. N. S.

In 1919, Weed and McKibben (1) studied the effects of intravenous injections of various concentrations of solutions, on the brain and spinal cord of cats. Using a manometer attached to a spinal puncture needle, they found that isotonic solutions caused but a slight rise in cerebrospinal fluid pressure, whereas the injection of distilled water gave a very marked and lasting rise in pressure. In some cases (2) they trephined the skull; in others, they did not. On studying the brains histologically, they found that in the latter cases (using hypotonic solutions), there were dilated pericellular spaces, while in the former (using either solution), the brain was histologically normal.

In 1923, (3) Weed, continuing these experiments, injected hypotonic solutions intravenously and examined the brains histologically. The cells of the choroid plexus were found to be increased in volume and otherwise changed. In the cerebral cortex there was much edematous tissue and the perivascular channels were markedly distended, as were also the perineuronal spaces, but the nerve cells were not compressed. Weed noted further, that the greatest histological changes occurred in those animals which had exhibited the greatest increase in cerebrospinal fluid pressure.

In 1925, Kubie and Schultz (4) found that on irritating the meninges of cats, lymphocytes entered the perivascular spaces in large numbers. On draining the cerebrospinal fluid, these lymphocytes poured out into the subarachnoid space. The first drainage specimens contained a relatively high percentage of polymorphonuclear cells and macrophages, but as the drainage continued these cells decreased in number while the lymphocytes rose from 20 to 80 per cent. An intravenous infusion of distilled water was then given simultaneously with the drainage, and spinal fluid again began pouring out. This time the cells were almost entirely lymphocytes. The tissues were then studied microscopically and it was found that the infiltration in the perivascular channels had been washed out, by this method of giving intravenous hypotonic solutions coincident with drainage of the subarachnoid space.

Kubie (5) next tried to find out if the intracranial pressure is increased by this procedure. He trephined dogs, inserted canulas snugly into the openings and connected these to manometers. On injecting hypotonic solutions, the intracranial pressure rose markedly. When the cisterna were being drained, however, the pressure rise was small and of short duration. On giving tap water by mouth, there also was a rise in intracranial pressure at first; later it dropped, as the kidneys established diuresis.

Weed and McKibben had shown that no hydration of the brain takes place on the administration of intravenous hypotonic solutions, in animals whose skulls have been trephined. In 1928, Kubie (6) undertook to show that cisternal puncture would give the same effect as trephining. Using rabbits and dogs, he drained half of the animals, while the other half was not drained. The former showed no edema of the brain. In the latter, hydration of the brain took place and this was found to be predominantly in certain areas, namely: the ventricles and central canal, choroid plexus, perineuronal space, and perivascular channels. There was no hydration of the neurones.

The first clinical application of all these experiments was reported by Spurling (7) in May, 1928. He treated a case of poliomyelitis, two cases of brain abscess, and four of men-

ingitis. His procedure was to remove the second lumbar vertebra, incise the dura mater and insert a rubber drain. He stated: "Fluid intake should be kept as high as possible, not lower than 500 c. c. per 24 hours. Fluids may be given by mouth, hypodermically, by rectum, intravenously or intraperitoneally."

In June, 1928, Kubie (8) studied the effects of "forced drainage" of the cerebrospinal fluid on human beings. With spinal puncture needle in place, he gave hypodermoclyses of 200-300 c. c. of 0.45% to 0.9% solutions to three infants, intravenous injections of the same to five patients, and fluids by mouth to five others. The subcutaneous route was least effective in increasing the flow of cerebrospinal fluid. There were no ill effects in any case. He noted that the types of cells which increased in the cerebrospinal fluid depended on the types of cellular exudate in the depths of the central nervous system tissue.

Fremont-Smith, Putnam, and Cobb (9) in 1930 employed a modification of Kubie's method in 16 patients with non-suppurative diseases of the central nervous system. They confirmed Kubie's idea of perivascular lavage. About the same time Virgil Casten (10) successfully used the method in an attempt to wash the arsenic out of the cerebrospinal fluid, in a case of trypanamide amblyopia.

TECHNIQUE AND PROCEDURE

The procedure of forced drainage of the central nervous system is as yet subject to considerable variation. The procedure advocated by Retan (11) in November, 1937, for poliomyelitis, is as follows: 1. With patient on Bradford frame, a lumbar puncture is performed.

2. Only enough cerebrospinal fluid as is needed for laboratory examination, is removed.

3. Stylette is replaced in the spinal needle and patient rotated onto his back so that the needle projects through a window in the Bradford frame.

4. An intravenous infusion of 0.375% sodium chloride solution is given at the rate of 10 c. c. per pound of body weight per hour for three hours, and at a slightly slower rate for two hours longer.

5. At half-hour intervals the nurse allows 2 to 5 c. c. of cerebrospinal fluid to flow from the spinal needle.

6. The interval between the first and second treatments must not exceed four hours; between the second and third treatments, six hours.

7. Indications for further treatment, are: (a) cell count above 20, twelve hours after completion of third treatment; (b) continued elevation of temperature; (c) any change in the reflex picture.

From other papers by Retan (12) (13), the following points of technique may be added: Several hours before treatment, give the patient food high in protein content and also a few glasses of water. If the patient is dehydrated, precede the treatment with a clysis of normal saline. After spinal puncture, be certain that the Queckenstedt test is positive. If the cerebrospinal fluid spurts out, replace the stylette and remove it only intermittently until the spinal fluid pressure is nearer to normal.

The Bradford frame should be as long as the bed, 30 to 40 inches wide, and may be supported on blocks or suspended from hooks. The head of the frame should be eight inches higher than the foot. To protect the patient from exposure underneath the frame, blankets or heat by electric lights may be used. If the patient is delirious, it is better to insert the intravenous needle in the foot, since the foot can be better immobilized to the Bradford frame. Sedation may or may not be employed. Retan recommends three grains of amyltal two hours before starting the treatment and repeat in an hour. If there is a frontal headache during the treatment, it may be relieved by an ice-cap or an injection of codeine.

After the spinal needle is in place and the patient straightens out the legs, it may be necessary to push the needle in a bit further since straightening the legs increases the depth from the skin to the subarachnoid space by $\frac{1}{8}$ to $\frac{1}{4}$ inch. If drainage is continued for longer than a few hours, the tissues around the needle soften and the needle may slip out. In that case, resort to one of the following:

1. Replace the needle periodically.
2. Insert a large needle which is fitted over the smaller one and the smaller one withdrawn.
3. Use a needle with a Swift-wing attach-

ment. The wings of this needle are attached to the skin with adhesive tape.

4. Do a lumbar laminectomy.

THEORY OF FORCED DRAINAGE

The production of cerebrospinal fluid (13) is increased first, by dilution of the blood stream with a hypotonic solution injected intravenously, and secondly by drainage of the cerebrospinal fluid in the subarachnoid space, by lumbar puncture. The cerebrospinal fluid is thus formed not only at the choroid plexus, but also by transudation from capillaries throughout the parenchyma of the brain and spinal cord. This fluid courses through the perivascular channels to the subarachnoid space, washing with it the inflammatory exudates, toxins, etc., which are present in the perivascular spaces. Forced drainage is, in effect, a continuous lavage of inflamed central nervous system tissues. In addition, it possibly facilitates the transference of drugs and immune bodies from the blood stream to the cerebrospinal fluid. Also (14), in clearing the nervous tissues of inflammatory exudates and edema, it paves the way for intraspinal administration of drugs and serums.

MODIFICATIONS OF THE PROCEDURE

Retan (12) has done a great deal of work on monkeys experimentally inoculated with poliomyelitis and chorea, in an effort to find the best method of performing forced perivascular drainage. He points out that the variable factors which can be controlled, are:

1. Concentration of salt in the intravenous solution.
2. Rate of injection per pound hour.
3. Length of time of injection.
4. Interval between treatments.
5. Blood volume.
6. Possible use of hydration factor.
7. Use of pitressin or pituitary solution

The maximum effect would naturally be achieved with an intravenous solution which is just above the point at which hemolysis of red blood cells would occur. In vitro, this is 0.45% but actually, the intravenous solution is rapidly diluted as soon as it enters the vein. Retan at first used 0.45% solution, but he has since found 0.375% solution to be safe. In one case where a 0.2% solution was employed, hemolysis of the patient's cells took place. Reese and Shulak (15) have, however, used 0.225% sodium chloride solution in seventeen

cases, after testing the fragility of the patient's red blood cells. Each of their treatments lasts but one to two hours, and they use 1,000 c. c. of 0.45% sodium chloride solution for the first treatment. They recommend that the injection be given not faster than 20 c. c. per hour.

Virgil Casten (10) and Fremont-Smith, Putnam and Cobb injected an ampule of pituitary solution intramuscularly to prevent diuresis for several hours and thereby increase the production of cerebrospinal fluid. Casten gave two liters of water by mouth and 50 c. c. of distilled water by vein. The use of pituitrin is probably unnecessary since capillaries are more permeable in inflamed tissues and enough of the injected or ingested fluids therefore goes to the nervous tissues when they are inflamed. L. H. Smith (16) points out that once the direction of flow is well established, good results can be obtained by oral, in place of intravenous, administration of fluids.

Hydration of the brain had at first worried Retan but he now believes some hydration of the central nervous system tissues may be of benefit. Rosenhecht (17) makes use of the hydration factor by first injecting a liter of hypotonic solution, and draining the subarachnoid space after the intravenous infusion is ended.

Blood volume (17) is partly controlled by the rate of injection. An increase in blood volume can be detected by doing repeated blood counts during a course of treatment. Blood-volume changes depend on the condition of the cardiovascular system and kidneys. If the heart is weak, or the arteries inelastic, or kidney function inadequate, the injection should be given at a slower rate.

DANGERS AND CONTRA-INDICATIONS

The most serious danger (12) to be avoided is that of cerebellar herniation. It may be prevented by remembering not to limit fluids before the treatment, not to remove too much cerebrospinal fluid before beginning the intravenous infusion, and not to continue the spinal drainage after the intravenous is ended. Cerebellar herniation is most frequent in cases of septic meningitis. It may be divided clinically into three stages. In the first stage, there is suboccipital pain and project vomiting. Replace the stylette for one-half hour, but continue the intravenous. In the second

stage the pulse becomes slow (40 to 60), respirations also become slow and then jerky. At this point, replace the stylette, discontinue the injection, and elevate the foot of the bed. In the third stage there is bloody spinal fluid, dysphagia, clonus, convulsions, and respiratory paralysis. The treatment here is as for the second stage, but if relief is not obtained, inject 50% glucose intravenously.

Other dangers are: hemolysis of blood cells; secondary infection from the spinal needle, and chills probably due to the solution injected or to the rubber tubing.

The contra-indications to forced perivascular drainage, are: 1. Lesions into which fluid will filter and cannot escape, for example, cystic tumor, obstructive hydrocephalus, acute myelitis with block.

2. Inflammation of lungs or bronchi. As already mentioned, fluids permeate capillaries of inflamed tissues more readily, and would therefore cause acute edema of the lungs, in these conditions.

3. Acute infections or inflammatory processes elsewhere in the body, in general. If the patient has pyuria, for example, injection of hypotonic solutions will result in polyuria rather than an increase in cerebrospinal fluid production. The polyuria is beneficial, not harmful, to the kidney or bladder infection, so this would not, strictly speaking, constitute a contra-indication. However, the treatment would be useless for the disorder of the central nervous system which we are trying to treat.

4. Cardio-vascular-renal disease.

INDICATION

In anterior poliomyelitis, the Virchow-Robins perivascular spaces are dilated and infiltrated with many lymphocytes and a few polymorphonuclear cells. The first case of infantile paralysis reported treated with forced drainage was a nine-year-old girl treated by Retan (18) in 1930 for almost 28 hours; it resulted in complete recovery. Retan later experimented on monkeys and made the statement (12): "As far as I have been able to learn from a review of the literature, there have been no cures of this disease by any method when the monkey has been innoculated, with adequate doses of virulent virus. It is therefore significant that six monkeys with acute poliomyelitis treated by this method have recovered without paralysis." Retan and

Kubie (14) point out that in 106 patients with pre-paralytic infantile paralysis treated by Aycock and Luther with serum alone, one died and 65 developed paralyses. The death rate in epidemics is 5 to 40%; death is usually due to paralysis of respiratory muscles or to pneumonia following a partial paralysis of these muscles. When there is paralysis of the muscles of deglutition, the mortality is 50%. In 1937 Retan (11) reported on 57 patients with acute poliomyelitis treated with forced drainage. None died, and only three pre-paralytic cases developed paralyses. Most marked success was achieved in ten cases of respiratory paralysis and in six patients with paralysis of the muscles of deglutition. In every instance, the recovery was prompt, being apparent a few hours after completion of treatment.

The table presented herewith gives, roughly the results of treatment of various disorders of the central nervous system with forced perivascular (spinal) drainage. Not included in the table are cases of post-infectious cortical atrophy, infectious myelitis, cerebellar cyst, and headaches of undetermined origin, treated by Reese and Shulak (15) with varying results.

DISEASE	Reference	No. of Cases	Result
1. Poliomyelitis	18	1	Good
	16	1	Good
	11	57	Good
2. Meningitis			
(a) Meningococcic	19	1	Poor
(b) Staphylococcic	16	1	Poor
(c) Miscellaneous	18	3	Poor
	19	5	Poor
(d) Tuberculous	19	2	Fair
	16	1	Good
3. Syphilis of C. N. S.	18	1	Good
	16	1	Fair
	19	4	Fair
	15	1	?
4. Chorea (Sydenham's)	15	1	?
	19	1	Good
5. Encephalitis			
(a) Acute	15	2	?
	18	1	Good
	19	1	Good
(b) Chronic	19	3	Poor
	15	5	?
6. Multiple Sclerosis	9	11	?
	15	2	?
7. Tryparsamide Amblyopia....	10	1	Good

In septic meningitis, failures are often due to neglect to remove the primary focus of infection (mastoiditis, for example), or to plastic exudates on the pia-arachnoid which act as new foci and which also may obstruct the flow of cerebrospinal fluid. In a personal com-

munication, Retan advises the addition of sulfanilamide to the hypotonic solution for the treatment of streptococic or meningococic meningitis. Retan (18) reports the case of a five-month old colored baby with syphilitic meningitis which had been treated with sulpharsphenamine and bismuth unsuccessfully. It developed hydrocephalus which became progressively worse. After four courses of forced drainage with hypotonic solutions to which neoarsphenamine had been added, the baby was completely cured.

To demonstrate the safety of forced drainage, Retan (19) mentions the case of a four-year-old baby with tuberculous meningitis who was treated for 18 days, having been given but two 24-hour periods of rest. During that time, a total of 26,260 c. c. of fluids had been administered, and a total of 3,338 c. c. of cerebrospinal fluid had been drained off. The patient recovered fully.

Worth mentioning also is Virgil Casten's (10) treatment of a case of trypanamide amblyopia. Casten states that out of 1,254 patients with neurosyphilis treated with trypanamide, 15% developed subjective or objective visual disturbances. Arsenic appears in the cerebrospinal fluid after an intravenous injection of trypanamide and affects the optic nerve directly; hence an attempt should be made to wash the arsenic out of the cerebrospinal fluid. Casten's patient had received two injections of trypanamide and he rapidly became practically blind. Fundus examination revealed optic neuritis. With each course of forced drainage, his sight improved. A check-up four months later showed 20/15 vision in each eye, with only moderate peripheral contraction.

REPORT OF ORIGINAL CASES

The following patients were treated with forced drainage at the Doris Memorial Hospital, the contagious disease unit of the Wilmington General Hospital:

I. C. M., age 7, male (service of Dr. Boines, Hosp. No. 186) was admitted July 9, 1937, with the complaint of headache, drowsiness and sore throat of four days' duration, and paralysis of the right arm with pain since the day before admission. Past history is irrelevant. Physical examination revealed a drowsy child with a temperature of 102.2° F., complaining of pain in the back of his head

and frontal headache. He had an injected pharynx, rigidity of the neck, bilaterally enlarged cervical glands, some limitation of chest motion on the right side, and total flaccid paralysis of the right shoulder and arm down to the fingers. Reflexes: abdominal and cremasteric present; knee jerks increased; Babinski and ankle clonus, positive; Kernig and Brudzinski, very markedly positive. Spinal fluid examination showed a cell count of 25, faint trace of globulin; normal reduction of sugar. Blood culture, throat smear and culture, blood Wassermann and Kahn were all negative. Urine was normal. Blood count: W. B. C., 19,200; polynuclears, 80%; lymphocytes, 18%; monocytes, 2%; R. B. C., 5,370,000; hemoglobin, 84%.

The following day, forced perivascular drainage was started. 900 c. c. of 0.375% sodium chloride solution was given intravenously over a period of 5½ hours, and 47 c. c. of spinal fluid released. Two hours later, the patient's pulse became weak and thready, his respirations increased from 30 to 48 and later his chest wall became paralyzed so that his breathing was entirely diaphragmatic. A respirator was ordered, but meanwhile, a second course of forced drainage was started, five hours after completion of the first treatment. 3000 c. c. of 0.375% NaCl solution was injected intravenously, and 22 c. c. of spinal fluid withdrawn, over a period of six hours. The patient had a chill during this treatment, but his condition became much improved and he regained use of his chest muscles. Seven hours later, a third treatment was instituted and 3000 c. c. of 0.375% solution infused in six hours and 48 c. c. of spinal fluid drawn off. In the next 12 hours, the patient's temperature dropped from 103.8° to 99.4° and it never again rose above 100. His course from then on was entirely one of improvement. On July 22 he was able to move his right hand and wrist. On July 24 he could also move his right shoulder. He did not become completely afebrile until August 7. On September 10 he was discharged, with paralysis only of the right arm and forearm.

II. D. R., age 5 years, male (service of Dr. Boines, Hosp. No. 225), was transferred from the Wilmington Homeopathic Hospital on September 7, 1937. On September 5 he had had two convulsions a half-hour apart and

then vomited a great deal, following which there were four to five more convulsions. The convulsions consisted of twitchings mainly of the facial musculature, with apparent paralysis of the right side of his body. Past history revealed convulsions of the same type at the age of 1½ years. He was admitted to the Homeopathic Hospital on September 6 with temperature 102°, pulse 160, and respirations 44. Spinal fluid examination showed 20 cells per cu. mm.; globulin and sugar tests positive. The blood sugar was 167 mgm. Stool examination was negative for ova and parasites. The urine contained a trace of albumin, one plus acetone, 5 W. B. C. per H. P. F., and many small hyaline casts. Blood count: W. B. C. 12,850; polynuclears, 57%; lymphocytes, 43%; R. B. C., 3,210,000; hemoglobin, 53%; slight polychromatophilia, anisocytosis, poikilocytosis. On admission to the Doris Memorial Hospital, the patient's condition was critical. He was unconscious, but moved various part of his body at intervals. He moved his right arm much more than his left. Cervical lymph nodes were moderately enlarged, and there was slight rigidity of the neck. Reflexes: abdominal and cremasteric absent; biceps and knee-jerks hyperactive, more so on the left side; angle clonus and Babinski, positive.

Perivascular drainage was started ten hours after admission at 8:00 p. m., but one hour later the patient became cyanotic, his breathing became shallow, and respirations finally stopped at 9:45 p. m., although the heart continued to beat for five minutes longer. An autopsy was done and showed vascular congestion of the pia-arachnoid of the spinal cord, capillary congestion of the dura over the brain, and dilated vessels on the floor of the fourth ventricle, with an occasional vessel showing perivascular lymphocytic infiltration. The sulci of the brain were completely flattened and there was a marked pressure cone of the cerebellum. The histological diagnosis was poliomyelitis; and cloudy swelling and fatty infiltration of the liver.

III. F. D., age 2 years, male (service of Dr. Boines, Hosp. No. 227), was admitted on September 8, 1937, with a history of having had colds all summer. Ten days previous, he developed a sore throat, tonsillitis, and high fever. This improved, but a week later he became feverish again and his left leg became

weak. His appetite was very poor but he had had no vomiting and no convulsions. Physical examination revealed a well-nourished baby, not very sick, with inflamed tonsils, enlarged cervical lymph nodes and some neck rigidity. He could move both legs, but his left leg was much weaker than the right. Reflexes: Babinski, positive on right side, negative Babinski and plantar reflex on left side; knee jerks, active on right side, absent on left side. Temperature, 100.2°. Pulse, 110. Respirations, 30. Urinalysis was negative. Blood count: W. B. S., 12,250; polynuclears, 37%; lymphocytes, 54%; monocytes, 2%; eosinophiles, 7%; R. B. C., 4,490,000; hemoglobin, 59%.

Forced drainage of the central nervous system was started seven hours after admission; 1500 c. c. of 0.375% solution was given and 40 c. c. spinal fluid drained, in six hours. Four hours later, the temperature came down to normal, so further treatments were not given. The patient did not develop any other paralyses nor any complications, and the weakness of his left leg improved gradually until his discharge on October 11, 1937.

IV. W. E. K., age 12 years, male (service of Dr. Levy, Hosp. No. 236), entered on September 19, 1937. On September 14, he had a headache. The next day, he had a sore throat and stiffness of the neck. He was better for a few days. Then, on the morning of admission, he woke up with a headache, vomited, had a convulsion, and became unconscious. Past history is negative except for measles at two years of age, scarlet fever at five, and rheumatic fever at nine years. Temperature on admission, 104.4°, pulse, 90, respirations, 30. Physical examination: well-developed, well-nourished white boy lying restlessly in bed, complaining of pain. Eye signs negative. Examination of fundus negative. Neck is very rigid. Reflexes: positive Brudzinski and Kernig; abdominal not elicited; cremasteric, active; knee-jerks, active; Babinski, negative. Spinal fluid report: greatly increased pressure; 7,538 leukocytes; sugar, negative; globulin, normal; culture, no growth. Blood count: W. B. C., 30,000; polynuclears, 90%; lymphocytes, 10%; R. B. C., 5,000,000; hemoglobin, 82%.

The patient was immediately given anti-meningococci serum and in six days had re-

ceived 80,000 units of serum intraspinously, 200,000 units intravenously, and 140,000 units intramuscularly. He was also started on prontosil, 10 c. c. intramuscularly every six hours, and on September 23, prontosil solution was given subcutaneously and intraspinally.

His condition became progressively worse. Rigidity of the entire body was extreme, and retraction of the head was so severe as to cause dysphagia. Spinal fluid cell count on September 23 was 5,648. Temperature curve remained septic. The prognosis was given to the parents as hopeless.

On September 24, perivascular drainage was instituted. 1950 c. c. of 0.375% NaCl was given intravenously and 75 c. c. of cerebrospinal fluid withdrawn, over a period of six hours. The spinal fluid at the beginning of treatment was very cloudy, while at the end it was clear. The next day, there was a very marked improvement in the patient's outward appearance. Spinal taps for relief of pressure were performed several times daily from then on. On September 25, the spinal fluid contained 497 cells; on September 27, it had but 42 cells; on October 3, no cells at all could be found. The patient continued to improve every day. On October 8, however, his temperature rose to 103. An x-ray of his chest showed bronchitis. Five days later, his temperature was again normal, and he was discharged on October 25 as completely cured.

CONCLUSIONS

A discussion has been presented of forced drainage of the central nervous system, its anatomical and physiological basis, and the experiments which led to the conception and perfection of the method. The technique, ways in which the technique may be modified, and contra-indications to the procedure, have also been discussed. The results of other authors have been presented. These results show the treatment to be highly successful in anterior poliomyelitis, and quite promising in other disorders. Four original cases have also been presented; two of poliomyelitis and one of cerebrospinal meningitis, with prompt recovery; and one of polioencephalitis, which died 12 hours after admission.

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UNDULANT FEVER:

Its Treatment With Sulfanilamide

Brucella melitensis, originally known as *Micrococcus melitensis*, is pleomorphic, its morphology in part determined by the culture medium or the preparation used for its study. Morphologically it is considered variously by several authors on bacteriology to be a coccus, a bacillus or a cocco-bacillus. On this basis, with the effect of the drug in question established against certain other pathogenic bacterial forms, Robert L. Stern and Ken W. Blake, Los Angeles (*Journal A. M. A.*, May 7, 1938), working independently, gave sulfanilamide in therapeutic doses to each of three private patients suffering from clinically and serologically established undulant fever. Highly satisfactory and prompt results with clinical cure followed. The maximal dosage according to present standards appears to be necessary.

BOOK REVIEWS

Medical Writing: the Technic and the Art. By Morris Fishbein, M. D., Editor, Journal of the American Medical Association. Cloth. Pp. 212. Chicago: American Medical Association, 1938.

This new work of Fishbein's represents the gradual evolution of his two previous works on this subject, and presents the current practice of the A. M. A. Press; it is the style book for the medical writing of today, and is especially applicable to the literature of periodicals. Written by the editor with the largest experience in America, and perhaps in the world, it is the most authoritative manual of its kind extant. Here is a book that should be in the hands of every man who attempts to write medical papers.

New and Nonofficial Remedies, 1938. Containing descriptions of the Articles Which Stand Accepted by the Council on Pharmacy and Chemistry of the American Medical Association on January 1, 1938. Cloth. Price, \$1.50. Pp. 592, LXVI. Chicago: American Medical Association, 1938.

In this book the Council on Pharmacy and Chemistry lists and describes the medicinal preparations that it has found acceptable for general use by the medical profession.

New substances described in this volume are Sulfanilamide and Protamine Zinc Insulin, with the accepted brands. The proved value of these new additions to the physician's armamentarium bids fair to make the past year a milestone in therapeutic progress. The council is to be congratulated on the promptness with which it evaluated these drugs and established standards for their adequate control. From the first the council warned against using Sulfanilamide in untried combinations. The sad tragedy of the deaths from the rashly introduced Elixir of Sulfanilamide-Massengill starkly emphasizes the value of such a body as the council to the medical profession and the pharmaceutical manufacturers as well as to the public. Of course this potential value cannot become effective as long as those concerned refuse to follow the council in the use of new remedies.

Other noteworthy new drugs which appear in New and Nonofficial Remedies 1938 are Avertin with Amylene Hydrate, Vinethene, Pontocaine Hydrochloride, basal, general and local anesthetics respectively; Novatropine and Syntropan, synthetic mydriatics.

Physicians who wish to know why a given proprietary is not described in New and Nonofficial Remedies will find the "Bibliographical Index to Proprietary and Unofficial Articles Not Included in N. N. R." of much value. In this section are given references to published articles dealing with preparations that have not been accepted. These include references to the reports of the council, to reports of the A. M. A. Chemical Laboratory and to articles that have appeared in THE JOURNAL OF THE A. M. A.

Annual Reprint of the Reports of the Council on Pharmacy and Chemistry of the American Medical Association for 1937, with the Comments That Have Appeared in The Journal. Cloth. Price, \$1.00. Pp. 201. Chicago: American Medical Association.

This book is a great deal more than a mere record of the negative actions of the Council on Pharmacy and Chemistry. It gives in full the reasons for the Council's rejection of various preparations, but it also records results of the Council's investigations of new medicinal agents not yet out of the experimental stage, and frequently contains reports on general questions concerned with the advance of rational drug therapy. All three categories of reports are represented in the present volume.

This issue of the Reports is remarkable for the series of valuable status and preliminary reports published by the Council in the past year. These include the reports on Avertin with Amylene Hydrate (now accepted for New and Nonofficial Remedies), Benzedrine Sulfate (the active constituent of the notorious "pep" pills, but a promising drug when its limitations are recognized), Catgut Sutures (a survey of the sterility of the market supply), Evipal Soluble (a comprehensive review of the evidence for the usefulness and limitations of the drug), Histidine Hydrochloride (a study of the usefulness of the drug in peptic ulcer, to be considered in connection with the report rejecting Larostidin, a proprietary brand, for unwarranted and exaggerated claims), Mandelic Acid (an authoritative statement of the limitations of this drug which the Council has now accepted), and Vinethene (a careful study of the evidence of the drug, which the Council has accepted for one year as an anesthetic to be used in short procedures).

(Concluded on Page 146)

EDITORIAL

DELAWARE STATE MEDICAL JOURNAL

Owned and published by the Medical Society of Delaware. Issued about the twentieth of each month under the supervision of the Publication Committee.

W. EDWIN BIRD, M. D. _____ Editor
Du Pont Building, Wilmington, Del.

A. V. GILLILAND, M. D. _____ Associate Editor
State Welfare Home, Smyrna, Del.

M. A. TABUMIANZ, M. D. _____ Associate Editor & Bus. Mgr.
Du Pont Building, Wilmington, Del.
Telephone, Wilmington, 4368

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VOL. X

JUNE, 1938

No. 6

RE:HOSPITAL FOR NEGROES

The problem of hospital care for negroes in a city like Wilmington requires serious thought. The recent reiteration of the old statement that there should be a separate hospital for negroes here leads one to study the question anew. Aside from the advantages that would accrue from such a hospital maintaining a training school for colored nurses and providing clinical opportunities for colored physicians, the advance in civic-mindedness of the colored population in general is also worth considering, if and when such a hospital is economically feasible. Let us look into the question of feasibility.

If it be true that sufficient accommodation for colored patients is actually lacking, the

remedy lies in either enlarging the colored quarters in the existing hospitals, or in building a new and separate hospital for negroes. Suppose we analyze this latter proposition.

Wilmington and its environs has a population of 125,000, of which 11% is colored, or 13,750 negroes. In 1931 the Committee on the Costs of Medical Care discovered that, in a given year, 6% of the population will require and receive hospitalization. This makes 825 as the annual average number of negroes here who would need hospitalization. Yet in 1937 the four local hospitals admitted 1139 colored patients, 90% of whom were charity, and it seems safe to say that fully half of the remainder (the 10% who paid at least something) were compensation cases paid for by the employer. The two points here are that (1) Wilmington's negro population already enjoys one-third more hospitalization than the national average; and (2) any scheme for a separate institution must be regarded a 90-93% charity.

Furthermore, the new plant would have to be fairly large, even at the beginning. In 1937 the 1139 negroes received 17,163 patient days, or an average of 15 days, which means that a bed could be rotated 24 times a year, if the load was a fairly constant one. Accordingly, if such regular rotation prevailed last year, the negroes occupied 48 beds all the time, but due to the variations of the load the peak was around 60. On a standard basis, this peak of 60 should be a constant average of 57, or 11% of Wilmington's present 524 beds. Furthermore, 102 new beds are almost ready for occupancy, giving Wilmington 626 beds at last bringing this city of vast wealth up to the American standard of 5 beds per 1,000 of population, or 625 for the city. Of this new capacity of 626 beds, the colored proportion of 11% is 69 beds, so our present estimate of a normal demand for 60 colored beds seems quite reasonable. Now, the American Hospital Association considers a hospital "full" when 80% of its beds are occupied, as a safe margin of empty beds must be maintained to take care of emergencies; in other words, it would be economic suicide to build a negro hospital of less than 75 beds. As a matter of

fact, a separate hospital would stimulate their desire for hospitalization, especially for obstetrics, and in next to no time a full 100 beds would be required.

The cost of building a modern hospital varies greatly according to city, style, completeness, etc., but a fair national average figure is \$4,000 per bed, for grounds, building and equipment. This makes the Wilmington proposal cost a minimum of \$300,000 to erect. Assuming that the institution could be operated for 25% less than the other hospitals here, because it would have no white patients, the cost per bed per day would be \$4.50; and assuming that the 60 beds (80% of the total) were constantly occupied, the operating cost per year, for in-patients only, would be \$97,200, with receipts from patients about \$9,700, leaving a deficit here of \$87,500. Assuming further that the out-patient costs would parallel the in-patient costs at 75% of the costs in the present hospitals, this department would cost \$17,700, with receipts of about \$1,700, leaving a deficit here of \$16,000, or a total operating deficit of \$103,500 per year.

In 1937 the present hospitals spent over \$104,000 in maintaining 48 colored beds, and for 60 beds the cost would have been \$130,000. Add for the colored out-patients \$24,000, and the cost is \$154,000 per year, assuming that the additional 12 beds could be housed, and even then there is no such thing as 15 emergency beds available. Accordingly, it appears that by building such a separate negro hospital as has been outlined here a theoretical saving of approximately \$50,000 a year might be effected. It is only a matter of time before such an institution will be imperatively needed, as the present hospitals must soon enlarge their colored facilities or else give up the attempt to give them adequate facilities.

The situation appears to us as we have stated, but since there are no one-hundred-percenters in any field of human endeavor, we may be wrong. As a check, figures should be obtained from other sources. Exclusively for colored patients, there is in Baltimore the Provident Hospital of 124 beds, and in Washington the Freedmen's Hospital of 322 beds, and in Philadelphia the Frederick Douglass Memorial Hospital of 56 beds. Complete data as to census figures, costs of building, costs of operating, staff arrangements,

etc., should be obtained from these three colored hospitals of varying sizes before any decision is made as to the program for Wilmington. Then it may be found that our analysis is essentially correct, and that the main problem to find a suitable site and the necessary \$300,000 with which to begin building.

BOOK REVIEWS

(Concluded from Page 144)

Other notable reports of outright rejection of products are those on Causalin (Causyth), an unsafe and dangerous preparation proposed for use in arthritis; Glutamic Acid Hydrochloride-Caleo, proposed as a conveyor of hydrochloride acid, with unsubstantiated claims of clinical effectiveness; Larodon "Roche," proposed as a substitute for other well established analgesic and antipyretic drugs and marketed with exaggerated and unwarranted claims.

Two reports on Sulfanilamide appear, a nomenclature and status report together with reprints of THE JOURNAL editorials giving the warnings which, if obeyed, would have avoided the series of deaths which resulted from the marketing of the ill-fated Elixir of Sulfanilamide-Massengill.

At the end of this volume appears an eulogy of George Henry Simmons whose death deprived the Council on Pharmacy and Chemistry of its founder and American medicine of a worthy and faithful servant.

Pneumonia and Serum Therapy. By Frederick T. Lord, M. D., Clinical Professor of Medicine, Emeritus, Harvard Medical School, and Roderick Heffron, M. D. Field Director, Pneumonia Study and Service, Massachusetts Department of Public Health. Pp. 148. Price, \$1.00. New York: Commonwealth Fund, 1938.

An extremely well written, concisely phrased book. Marginal paragraphic headings throughout the book. Tables and figures simplified and easily understood. Written in a style that eliminates excess phraseology. Conclusions given clearly and concretely. An excellent book of its type and well worth while including in any library. In view of the great publicity given to pneumonia serum during the past winter this book could have been published at no more opportune time. It may do much to overcome the impression that the lay press have given — that all pneumonia cases given serum early recover and that all pneumonia deaths are due to the refusal of the medical profession to avail itself of the free serum.



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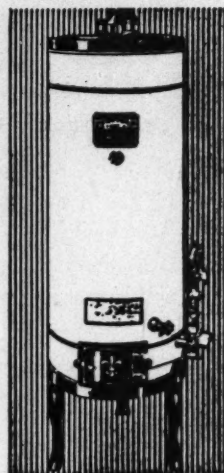
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